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(54) **Electronic equipment practice**

(57) The lower front rail (4) of an equipment practice unit, comprised by a pair of side plates (3) joined by a plurality of such rails, is stiffened in a first direction between the side plates by a member (11) which also increases its rotational stiffness about the first direction. The stiffening member (11) has a C-sectioned portion, joined to the rail (4) at intervals along its length, that also provides a cabling tray 11[1] and side flaps at each end which are in the plane of the side plates (3) and engaged therewith. The unit is particularly adapted for accommodating circuit boards for telecommunications equipment, the stiffened rail eliminates connector alignment problems caused by rail deformation.

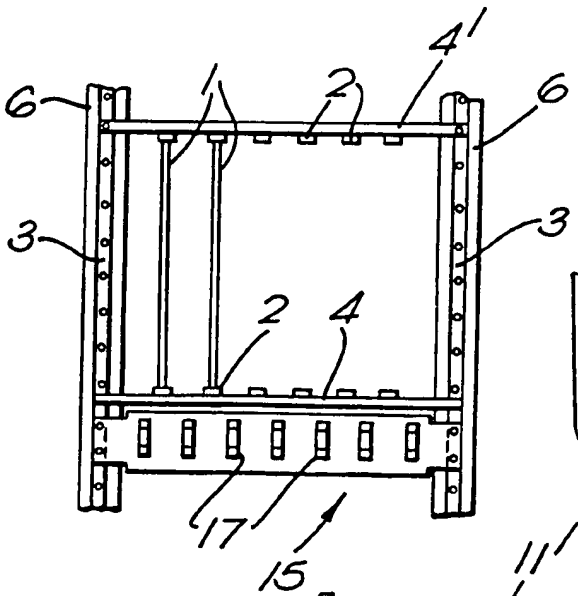

FIG. 1

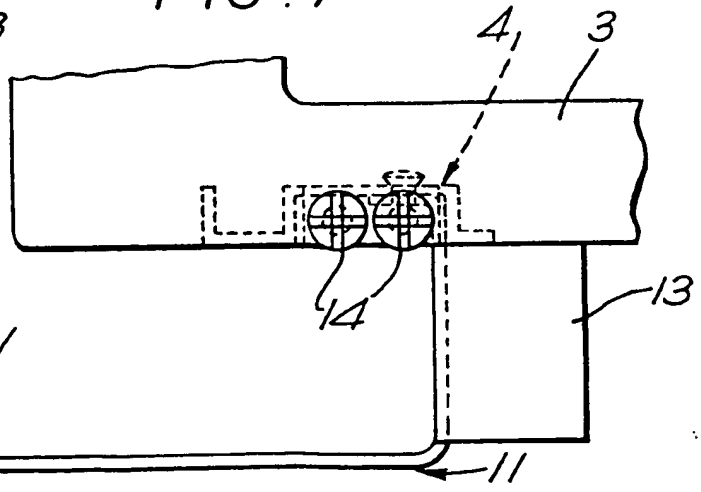

FIG. 7

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

FIG. 2

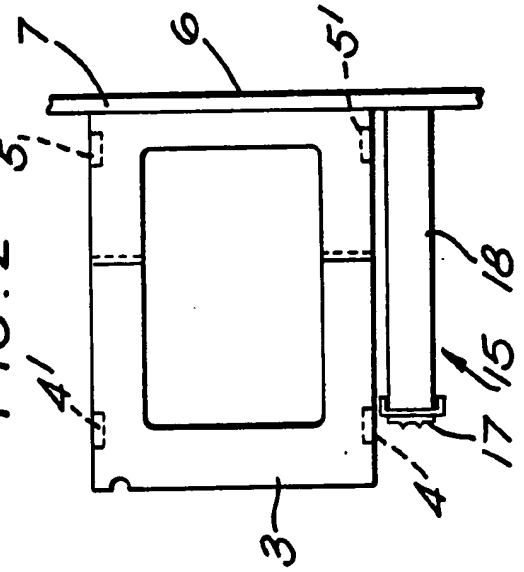


FIG. 1

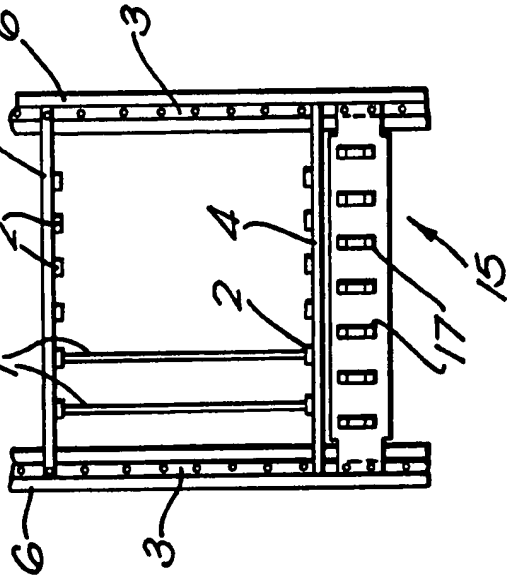


FIG. 3

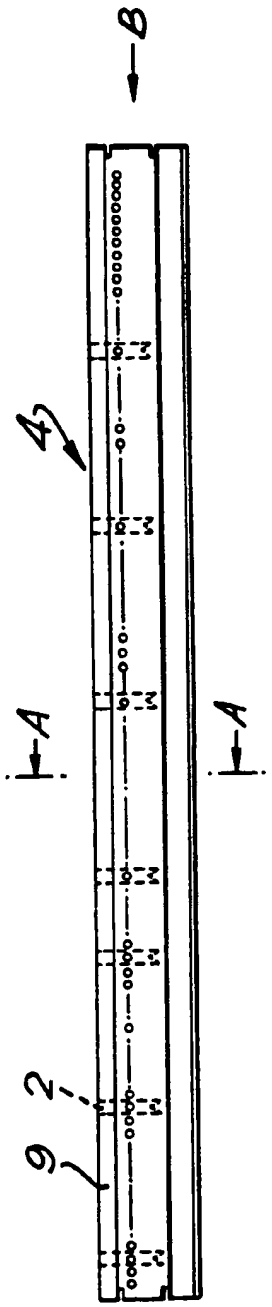


FIG. 4

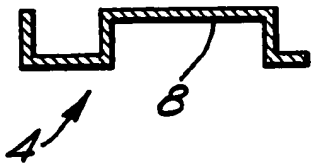


FIG. 5

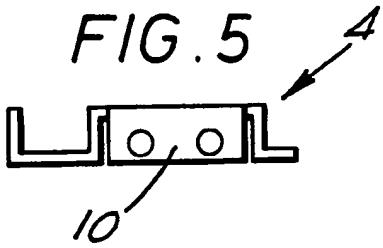


FIG. 7

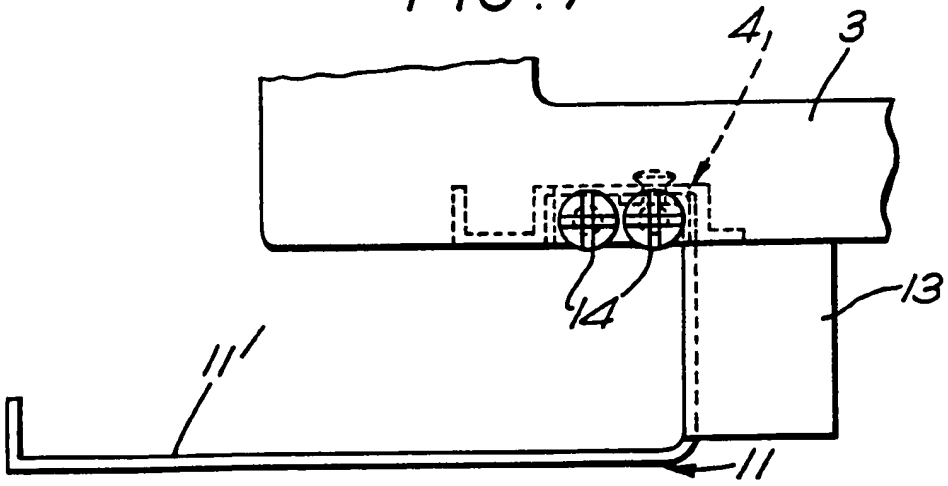


FIG. 6

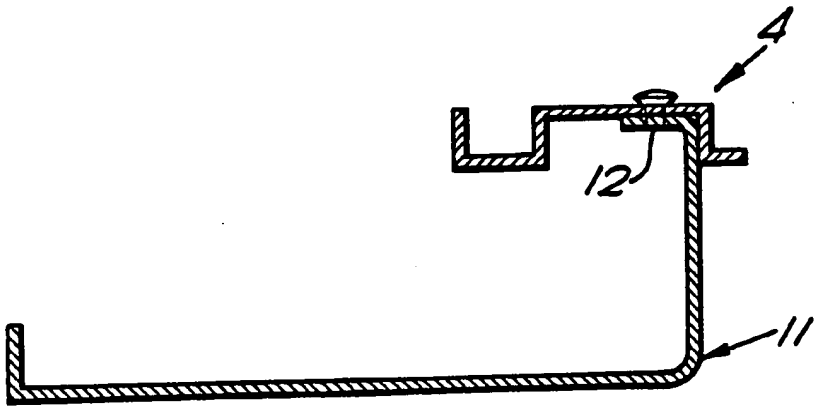


FIG. 8

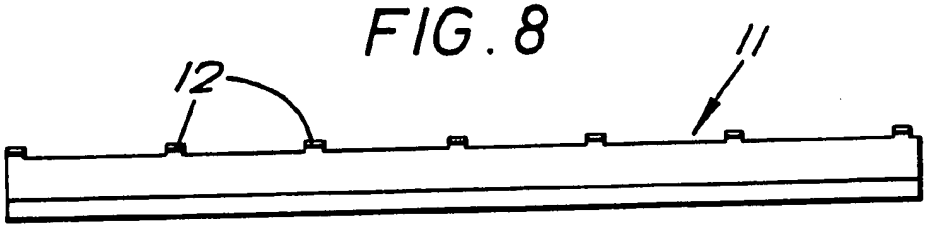
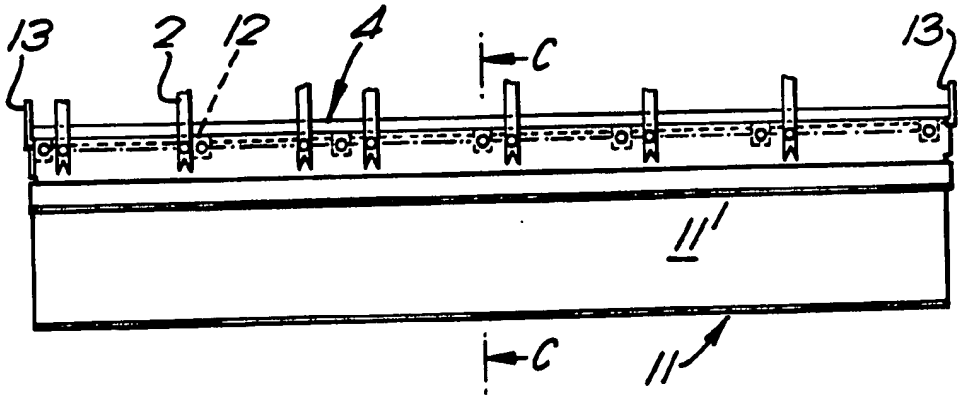


FIG. 9



EQUIPMENT PRACTICE

This invention relates to electronic, particularly, but not necessarily, telecommunications, equipment practice.

A conventional form of a particular type of telecommunications equipment practice comprises a cabinet having shelves in which circuit boards are disposed. Figs. 1 and 2 of the accompanying drawings are schematic front and side views of part of such a cabinet. The circuit boards 1 are in vertical planes and slide in runners 2 of the shelves to engage circuit board connectors with back plane connectors mounted in the cabinet (not shown). The shelves are basically parallelopiped structures which are open at the front and rear. They comprise a pair of parallel shelf side plates 3 which are joined by a pair of so-called rail members at the top and at the bottom edges of the side plates. Each pair comprises a front rail 4 or 4^1 and a back rail 5 or 5^1. Mounted between the rails of each pair 4,,5 or 4^1, 5^1 are the runners 2 in which the circuit boards slide.There is a top set of runners and a bottom set of runners per shelf. The runners are secured to the rails. The shelves are mounted to mounting verticals 6 on the rear wall 7 of the cabinet via flanges on the side plates. Such a shelf structure is not particularly rigid and in use the lower front rail 4, in particular, tends to be deformed by the weight of the circuit boards 1, leading, for example, to connector alignment problems.

According to one aspect of the present invention there is provided a shelf comprising a pair of side plates joined by a plurality of rail members to form a generally parallelopiped structure, wherein one said rail member is provided with means which serve to increase the stiffness of the one said rail member in a first direction between the sideplates and its rotational stiffness about the first direction.

According to another aspect of the present invention there is provided a stiffening element for one rail member of a shelf mountable in a cabinet and serving in use to support electronic equipment in the cabinet, the shelf being comprised by a pair of side plates joined by a plurality of said rail members to form a generally parallelopiped structure, which one rail member is disposed at a lower front edge of the shelf in use thereof, the stiffening member comprising a generally C-sectioned elongate portion adapted to be secured to said one rail member at intervals along its length, which C-sectioned portion serves as a cabling tray in use of the element, and comprising a respective side flap at each ends of the elongate portion, which side flaps extend in a direction away from the cabling tray and in use of the element are each in the plane of a respective shelf side plate and have an upper edge in contact with a lower edge of the respective shelf side plate.

Embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Fig .3 shows a plan view of a conventional front rail on an enlarged scale to Fig. 1.

Fig. 4 shows a cross-section taken on line A-A of Fig. 3, on an enlarged scale;

Fig. 5 shows an end view of the rail of Fig. 3 as seen looking in the direction of arrow B, on an even further enlarged scale.;

Fig. 6 shows a cross-section taken on line C-C of Fig. 9, on an enlarged scale, of a strengthening element of the present invention secured to a conventional front rail;

Fig. 7 shows an end view of the strengthening element secured to a shelf side plate via a conventional front rail, indicated by dashed lines, and showing a side flap/extension of the strengthening element;

Fig. 8 shows a front view of the strengthening element on its own on the same scale as Fig. 3, and

Fig. 9 shows a plan view of a conventional front rail secured to the strengthening element.

Referring firstly to Figs. 3 to 5 there is illustrated therein a conventional shelf front rail 4 which is manufactured from, for example, chrome steel. At a generally central section 8 of the rail a line of holes 9 are provided over substantially its entire length. These holes 9 serve in the mounting of the circuit board runners 2, indicated by dashed lines, to the rail 4 by screws (not shown). Which holes are employed is determined by the number of runners and the type of circuit board. At the ends of the rail 4 are bent down flange elements such as 10 which serve in the securement of the rail 4 to shelf side plates such as 3 (Fig. 2). Whereas the cross-section of the rail provides a degree of rigidity, if it is used in connection with a lot of heavy circuit boards there is a tendency for it to be deformed.

We have found that the stiffness of the rail 4 in the direction between the side plates can be substantially increased (by a factor of about 90) by the addition of an elongate strengthening member 11 which is of a generally C-shaped cross-section (Fig. 6). The strengthening member 11 extends along the length of the rail 4 but is only secured to it at intervals. The securement takes place at positions (nodes) defined by bent over projections 12 of the strengthening member 11,

see also Figs. 8 and 9. The spacing and number of projections 12 is related to the likely number of runners and type of circuit board since the rail 4 is secured to the projections 12 via screws in respective ones of the holes 9 in the rail 1.

At each end of the elongate strengthening member 11 there is provided a side flap/extension 13 (Figs. 7 and 9). When the rail 4 is secured to shelf side plates such as 3 (Fig. 7) by screws 14 in the conventional manner each side flap 13 is in the same plane as the respective side plate 3 and their facing edges engage one another. In other words the side flaps fit under and are in contact with the lower edge of the side plates.

As well as serving for strengthening purposes the C-section portion of the member 11 provides a cable channel/tray 11 carried by the shelf. Whereas the circuit boards 1 (Fig. 1) have connectors at their innermost, with respect to the shelves, edges for coupling to connectors of a back plane, the circuit boards may also be connected elsewhere via cables extending from their outermost edges, with respect to the shelves.

In the conventional arrangement of Figs 1 and 2 such cables are bundled together and secured to an independently mounted cabling support "tray" 15 comprised by a panel which will fill in a gap between two adjacent shelves. The panel has side arms 16 whereby it is mounted to the mounting verticals at the rear wall of the cabinet. Mounted to the panel are members 17 to which the cables can be connected. Conventionally, therefore interconnecting cables disposed at the front of the shelves are mounted to a vertical face of the cabling support tray or panel 15 and this involves relatively complicated means to hold the cables together and in place on the panel 15. Ducts (not shown) within the side of the cabinet are provided

for routing cables between shelves and other equipment (not shown) in the cabinet.

By use of the strengthening member 11 which has an integral cabling support tray 11^1, assembly is facilitated since the cabling can simply be laid in the tray 11^1. The weight of such cabling sitting in the tray 11^1 enhances the rotational stiffness of the rail 4 in view of the side flaps 13, which oppose rotation of the tray 11^1 by compressively engaging the lower edges of the side plates 3, since the rail 4/strengthening member 11 combination is not then loaded over its shear centre as is the case with the rail 4 alone, rather it is loaded in front of it. The use of such a cabling tray carried by the shelf also means that less vertical space between shelves, approximately 50% less, is required for cabling storage than when the conventional arrangement with separately mounted cabling trays and so the shelves can be disposed closer together. Thus in a particular size of cabinet it will be possible to accommodate an additional shelf or additional shelves.

CLAIMS

1. A shelf comprising a pair of side plates joined by a plurality of rail members to form a generally parallelopiped structure, wherein one said rail member is provided with means which serve to increase the stiffness of the one said rail member in a first direction between the sideplates and its rotational stiffness about the first direction.

2. A shelf as claimed in claim 1 which in use is mounted in a cabinet and serves to support electronic equipment therein and wherein the one said rail member is disposed at a lower front edge of the shelf when the shelf is mounted in the cabinet.

3. A shelf as claimed in claim 2 wherein the rail members are secured to the side plates at top and bottom edges thereto and carry runners extending parallel to the side plates in which circuit boards are slidable, wherein the rail stiffening means provides a cabling tray carried by the shelf for cabling extending from edges of the circuit boards outermost with respect to the cabinet.

4. A shelf as claimed in claim 3 wherein the rail stiffening means comprises a generally C-sectioned elongate portion secured to the said rail member at intervals along its length, which C-sectioned portion provides the cabling tray, and comprises a respective side flap at each end of the elongate portion, the side flaps being in the same plane as the respective shelf side plate, extending in a direction away from the cabling tray portion and having an upper edge in contact with a lower edge of the respective shelf side plate.

5. A stiffening element for one rail member of a shelf mountable in a cabinet and serving in use to support electronic equipment in the cabinet, the shelf being comprises by a pair of side plates joined by a plurality of said rail members to form a generally parallelopiped structure, which one rail member is

disposed at a lower front dge of the shelf in use thereof, the stiffening member comprising a generally C-sectioned elongate portion adapted to be secured to said one rail member at intervals along its length, which C-sectioned portion serves as a cabling tray in use of the element, and comprising a respective side flap at each ends of the elongate portion, which side flaps extend in a direction away from the cabling tray and in use of the element are each in the plane of a respective shelf side plate and have an upper edge in contact with a lower edge of the respective shelf side plate.

6. A shelf, for supporting electronic equipment in a cabinet, as claimed in claim 1 and substantially as herein described with reference to the accompanying drawings.

7. A stiffening element for a rail member of a shelf substantially as herein described with reference to Figs. 6 to 9 of the accompanying drawings.

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